between them a second secondary air gap, for displacement of the single movable magnet relative to a second degree of freedom.

18. (New) A bidirectional actuator according to claim 17, wherein the movable magnet is integral with a yoke.

19. (New) A bidirectional actuator according to claim 17, wherein the stator structure is composed of 4 poles of soft magnetic material, which define therebetween two pairs of secondary air gaps which cross at a central point and in that the primary air gap is planar.

20. (New) A bidirectional actuator according to claim 19, wherein the stator poles comprise 4 rectangular pieces, each wound by an electric coil, and defining between them two pairs of perpendicular secondary air gaps.

21. (New) A bidirectional actuator according to claim 17, wherein a ratio L/E of a thickness L of the magnet and a thickness E of the air gap ranges between 1 and 2.

22. (New) A bidirectional actuator according to claim 17, wherein dimensions of the secondary air gaps are $C_1 + E$ and $C_2 + E$, where C_1 and C_2 denote travel ranges of the movable magnet in directions of the secondary air gaps and in that dimensions of the magnet are $C_1 + d_1 + E$ and $C_2 + d_2 + E$, where d_1 and d_2 denote widths of the secondary air gaps.

23. (New) A bidirectional actuator according to claim 17, wherein the stator structure is composed of two stator pieces disposed one on one side and one on another side of the magnet, each stator piece having a pair of stator poles, the pair of stator poles of one of the pieces being oriented perpendicular to the pair of stator poles of the other stator piece.

24. (New) A bidirectional actuator according to claim 17, wherein the magnet has a tubular shape and is movable, in a first degree of freedom, by axial translation and, in a

second degree of freedom, by axial rotation relative to a stator structure formed from 4 stator poles in a form of cylinder portions, provided with a first secondary air gap in a longitudinal central plane, in which there is placed a first electric coil wound around at least one ferromagnetic core, and with a second secondary air gap in a transverse plane, in which there is placed a second electric coil wound around a ferromagnetic core.

25. (New) A bidirectional actuator according to claim 18, wherein the magnet has a tubular shape and is movable, in a first degree of freedom, by axial translation and, in a second degree of freedom, by axial rotation relative to an external cylindrical stator structure formed from 4 stator poles having a concave surface defining the primary air gap with the yoke placed inside the magnet, each of the four stator poles being wound by an electric coil.

26. (New) A bidirectional actuator according to claim 17, wherein the magnet has a tubular shape and is movable, in a first degree of freedom, by axial translation and, in a second degree of freedom, by axial rotation relative to a cylindrical stator structure comprising a first external stator piece for displacement in a first degree of freedom and a second internal stator piece for displacement in a second degree of freedom, each of the stator pieces having at least one electric exciting coil.

27. (New) A bidirectional actuator according to claim 17, wherein the magnet has a spherical shape and is movable in spherical rotation relative to a stator structure in a form of a spherical cup formed from 4 stator poles in a form of cup sectors provided with two coils located in peripheral grooves whose central planes are perpendicular.

28. (New) A bidirectional actuator according to claim 17, wherein the magnet has a spherical shape and is movable in spherical rotation relative to a stator structure of tubular shape formed from 4 stator poles in a form of tube quarters, wound by an electric coil.

29. (New) A bidirectional actuator according to claim 27, wherein the primary air gap has a spherical shape.

30. (New) A bidirectional actuator according to claim 17, wherein the magnet has a spherical shape and is enclosed by a spherical cup, and is movable in spherical rotation around a stator structure of spherical or hemispherical shape formed from 4 stator poles in a form of sphere quarters or eighths.

31. (New) A bidirectional actuator according to claim 17, wherein the magnet has a spherical shape and is enclosed by a cup formed from two pieces in a form of hemispheres or sphere quarters, and is movable in spherical rotation around a stator structure formed from two hemispherical stator pieces.

32. (New) A bidirectional actuator according to claim 17, wherein each of the pairs of poles defines between two adjacent poles a secondary air gap, and further comprising a sensor which is sensitive to magnetic fields and which is located in one of said secondary air gaps.

REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The present preliminary amendment is submitted to place the above-identified application in more proper format under United States practice. By the present preliminary amendment original Claims 1-16 are canceled and new Claims 17-32 are presented for examination. New Claims 17-32 are believed to be self-evident from the original disclosure, including original Claims 1-16, and thus are not deemed to raise any issues of new matter.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

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